Development of Hospital Information Management Systems

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Abstract — *Health institution requires quality data and information management to function effectively and efficiently. It is an understatement to say that many organizations, institutions or government agencies have become critically dependent on the use of database system for their successes especially in the hospital. This work aims at developing an improved hospital information management system using a function-based approach. An efficient HIMS that can be used to manage patient information and its administration is presented in this work. This is with the goal of eradicating the problem of improper data keeping, inaccurate reports, wastage of time in storing, processing and retrieving information faced by the existing hospital information system in order to improve the overall efficiency of the health institution. The system was developed with Hypertext Markup Language (HTML), Cascading Style Sheets (CSS), Hypertext Preprocessor (PHP), and My Structured Query Language (MySQL). The new system was tested using data collected from Renewal Clinic, Ibadan, Nigeria was used as case study were the data for the research was collected and the system was tested. The system provides a vital platform of information storage and retrieval in hospitals.*

Keywords — Hospital Information Management System (HIMS), clinic, information storage and retrieval.

I. INTRODUCTION

Hospital is an institution for health care that provides patient treatment by specialized staff and equipment. Usually, hospitals are funded by the public sector, by health organizations (for profit or non-profit), health insurance companies or charities, including funds by direct charitable donations. Historically, nevertheless, hospitals were often founded and funded by religious orders or charitable individuals and leaders. Modern-day hospitals are largely staffed by professional physicians, surgeons, and nurses.

The main aim of this work is to design an automated system for controlling the flow of patient's data in the hospital. This is to solve most of the problems encountered in the hospitals using the manual system of medical administration. In the manual system, almost all the patient files in the records have to be accessed by the hospital staff at every request.

The objectives of the work is to provide a system that will provide the following:

i. logical data collection and efficient data storage

ii. accurate data communication and manipulation

iii. data security so that the hospital data and information are stored centrally in a secure fail safe database.

Bose (2003) noted that the success of electronic health (e-health) depends critically on the collection, analysis and unified exchange of clinical and medical information or knowledge within and across the health institutions. In order to successfully exploit the social and economic benefits that are emerging as a result of E-healthcare, it is important to fully understand the developments in technology, social considerations, government fiscal policy and business objectives (Bali, 2000).

II. REVIEW OF RELATED WORKS

The literature review revealed the contextual issues and brief historical overview of hospital information management systems. Ouma and Herselman (2008) stated that government of most nations has engaged several means to promote the development of a basic national primary care program, but the major concerns abound about serious lack of specialized health care facilities. According to Adebisi*et al.* (2015), hospital system is one of the most complex of all administrative organizations. The primary objective of the hospital is to provide adequate care and treatment to the people. Several operational works done in a hospital include: recording information about the Patients, generating bill, recording information related to diagnosis given to Patients, Keeping record of the Immunization provided to patient, Keeping information about various diseases and medicines available to cure them etc. Most of this tasks are handled in most hospitals on manually. This necessitated the creation of an electronic means of keeping records, administering discharge, querying of data, prescription guide and also better accountability. Information technology in general enables intra organizational networking that facilitates effective

information flow within the various units of a firm. The application of information technology in health care is unceasingly evolving as the quality of patient care in contemporary times seems to depend on the timely acquisition and processing of clinical information related to the patient (Adegenjo et al., 2012). Hospital Management System provides the benefits of streamlined operations, enhanced administration and control, superior patient care, strict cost control and improved profitability (Olusanya*et al*. 2015)

Musa (2012) pointed out that one of the major challenges existing hospital management systems face is around operational efficiency and wait times between different processes, departments and persons. The paper highlights several short comings of old systems and proposed a RFID (Radio Frequency ID) and wireless sensor based , location and information management framework that facilitates real time tracking of hospital assets, personnel and patients as they move through pre-set procedures as part of daily activities of the hospitals. Illo*et al.* (2015) proposed a web-based real-time system for the betterment of medical research and analysis. Daiping*et al*., 2005 in their study on information system of health care services management in China hospitals paper proposed HSMS which aims at improving quality of services, identifying cost reduction areas, analyses and evaluate /rate heath care services. Olusanya et al. (2015) refers to clinics as organizations based on high technology and information intensive processes. The computerize clinic activities which includes diagnostic and treatment processes will add to the development of networks of clinical, hospital and health care processes (Smith and Pijl, 1999). In hospitals, over the years, a variety of models and schemes for hospital interventions and development have been deployed (Friesner, 2009). The storage and retrieval of patients' information is very crucial to improving the hospital medical care capability, decision-making process and the hospital working efficiency. In hospitals, over the years, a variety of models and schemes for hospital interventions and development have been deployed (Friesner, 2009).

III. SYSTEM ANALYSIS AND DESIGN METHODOLOGY

The approach used in designing the system is the structured design approach. It consists of starting with the "Big picture" of the proposed system that is gradually decomposed into more and more detail until it is fully understood.

Renewal Clinic, Ibadan, Nigeria was chosen as a case study. This is because of the ease of to their medical information and the physicians. The clinic was visited to collect appropriate data. The purpose of the visit is to find out the current state of their management system and how to computerize it and make it more efficient. Various medical personnel were interviewed in other to have an idea of their job description and challenges they are facing in the discharge of their duties. Their bills of payment, receipts and test results ledger were reviewed so as to get how they are referenced and saved for future works and the platform of how to make automate the information.

3.1 The Existing Management System at Renewal Clinic

The information flow in the clinic is a mono-directional system where the receptionist refers patient to doctors, doctors refers patients to the pharmacist either in or out patients and the same way out. The existing system in the clinic is completely manual. When a patient requests drugs from the staff in the pharmacy session, all the information is recorded manually from the drug dispenser (Pharmacist). Similarly when the supplier delivers drugs all the information from the dispenser to the account on drugs is recorded manually. Such a system is time consuming when figuring patient data which will lead to delay in generating medical report. Also, the system of information storage is vulnerable to security hitches such as illegal modification and update of records. Waste of time in data retrieval. Summarily, the existing system obviously reduces the efficiency of the clinic.

3.2 Requirement Analysis

Requirement analysis is an essential part of system analysis. Requirement analysis is the most difficult part of software development. In any system development, perfect requirement analysis is a must, as any error occurring in this stage, may end up to be a total failure of the whole system. Requirement analysis involves, setting up the analysis phase of the project by creating the necessary plans and agreeing the initial scope of the study. A detailed investigation of the existing system is undertaken, in terms of system process and data structure. Requirement analysis is the stage for designing the system's requirements and what the new system must do. Therefore, it involves identifying who needs what information where, when and how. Data, process and interface requirements for the new systems are also identified as this stage. Also physical description of the existing system will be converted into logical description.

3.3 The Conceptual Approach

During the preliminary investigation and requirement analysis of Renewal Clinic, the following fact finding techniques was carried out:

a. Interview

This is the most general way used to confirm the proposed system design and gather fact about the system. As it was not possible due to time constraint, to interview all the

employees and members of Renewal Clinic, the Director and some nurses were interviewed. The interviews consisted of both structured and unstructured questions. In the first interview all the questions were open-ended and unstructured. After reviewing the responses, a second interview was done. Both and ask both structured and unstructured questions based on the director's responses of the prior interview. After the second interview the system and requirement analysis were almost complete. The design and development of the system had started. Afterwards, the third and final interview was arraigned with the staffs. In that interview, only structured questions were asked regarding the new system that was developed.

b. Record or Document Review

As the documents represent formal information flow in the organization, thus it helps in understanding the existing system. The following documents were reviewed: Registration forms, patient Cards, Bills.

c. The Flowchart of the proposed System Flowchart

This is a chart that shows the different parts of the system and how they are arranged.

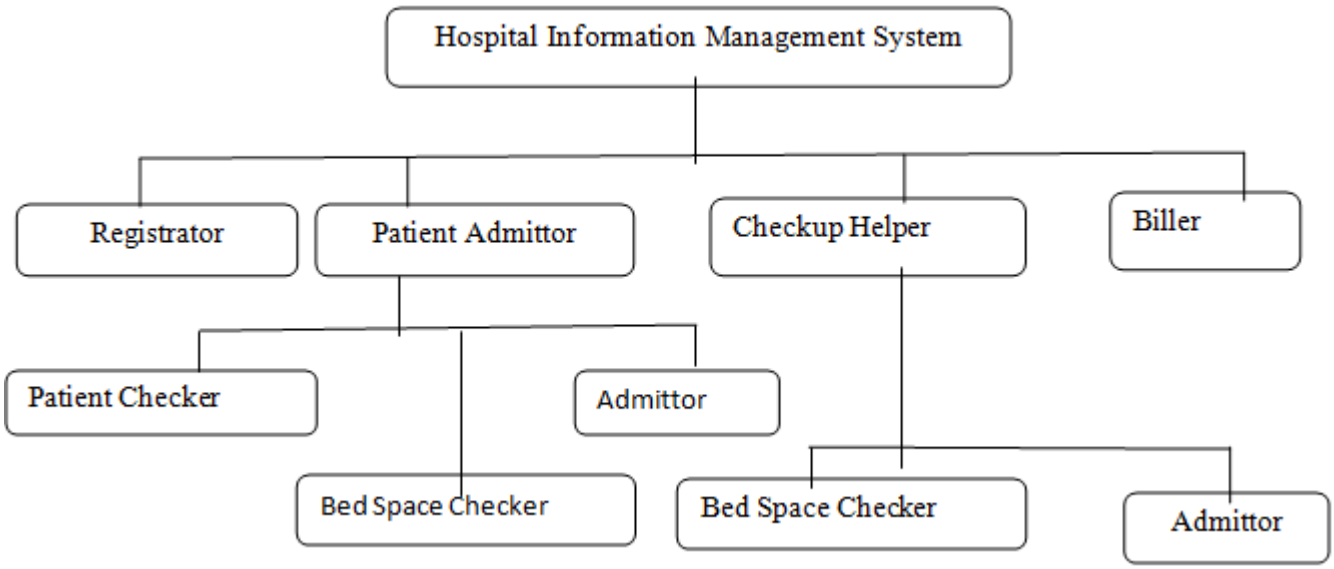

Fig.3.1: The flowchart of the proposed system

3.4 Architecture of the proposed System

The Hospital Information Management System for Renewal clinic will be a 3-tier application architecture. The presentation will be handled by packages such as the HTML, CSS, JavaScript. The application logic will be handled by PHP hypertext pre-processor (PHP) while the database is MYSQL database software.

The server will be located directly inside the ICT office for proper monitoring and maintenance operations. The diagram below shows the pictorial overview of the proposed system.

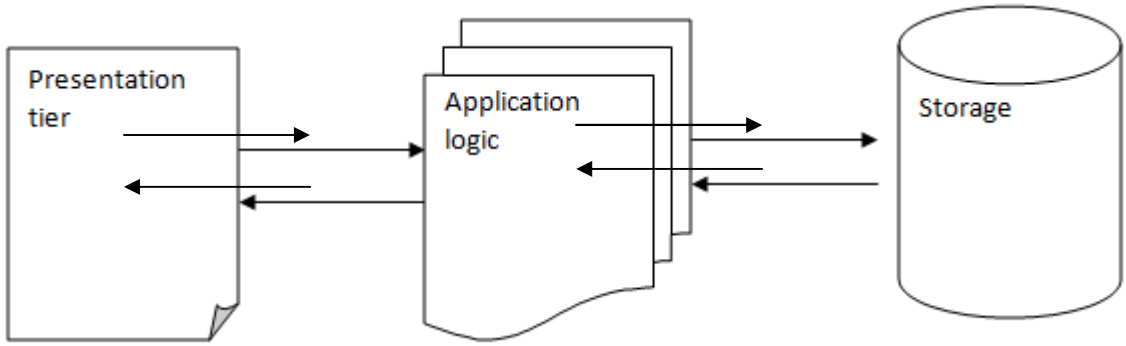

Fig.3.2: The Architecture of the proposed system

3.2 System Design and Implementation

A relational database management system (RDBMS) design was used to design the database with MYSQL. This organizes large amount of data and defines the relationship between the datasets in a reliable and comprehensible manner. RDBMS also provides a

structure which is flexible enough to accommodate almost any kind of data. The interface were developed using PHP, CSS and HTML. PHP was used to create links, manipulate pages, manage relational databases storage functions, process queries and request flash to integrate sounds and interfaces was done to develop the model that meets all the requirements of this system. MySQL was used to create and connect relational tables to the database. The system will function efficiently and effectively on a server with the following configuration:

- 2.0 GHz Intel Pentium IV Processor and above
- Minimum of 512MB of RAM
- Minimum of 80MB of available disk space
- Input devices (keyboard and mouse)

The software requirements of the implementation of this system include:

- Operating System: Microsoft Windows 2000 or higher, Window Vista, Linux
- MySQL
- Apache server
- PHP SCRIPT
- Internet Explorer (or other equivalent browsers such as Netscape, Mozilla Firefox, etc.)
- Wampserver

IV. RESULTS

Fig 4.1 to 4.5 describe the system inputs modules and Fig. 4.6 to 4.10 presents the system outputs respectively**.** The system verify and validate all user input. The user gets appropriate notification in case of any error in the course of the use of the system. The system captured patient's details which is used to create an account with the physician. The system generates the Patient Identity (ID) and also the Reference ID automatically and identifies inpatients and outpatients which is made possible by a checkbox.

The Proposed System Input: The following represent snapshots from the system, showing input forms through which required data is inputted into the system.

i. The Welcome screen: This shows the specific information to the user of the system for easy navigation. It is the first screen that shows up.

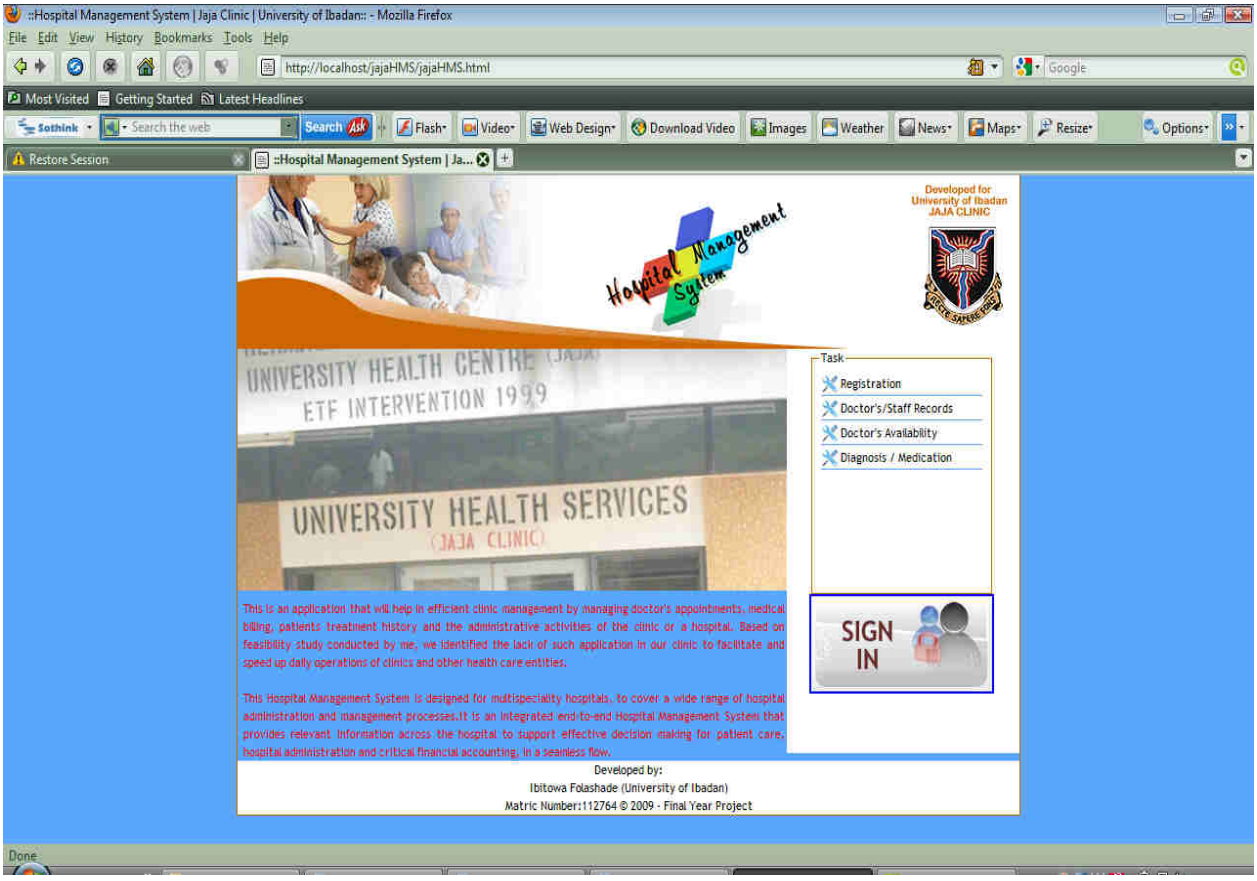

Fig.4.1: The Welcome Page

ii. The Login screen: This shows the login form which authorizes access to the system.

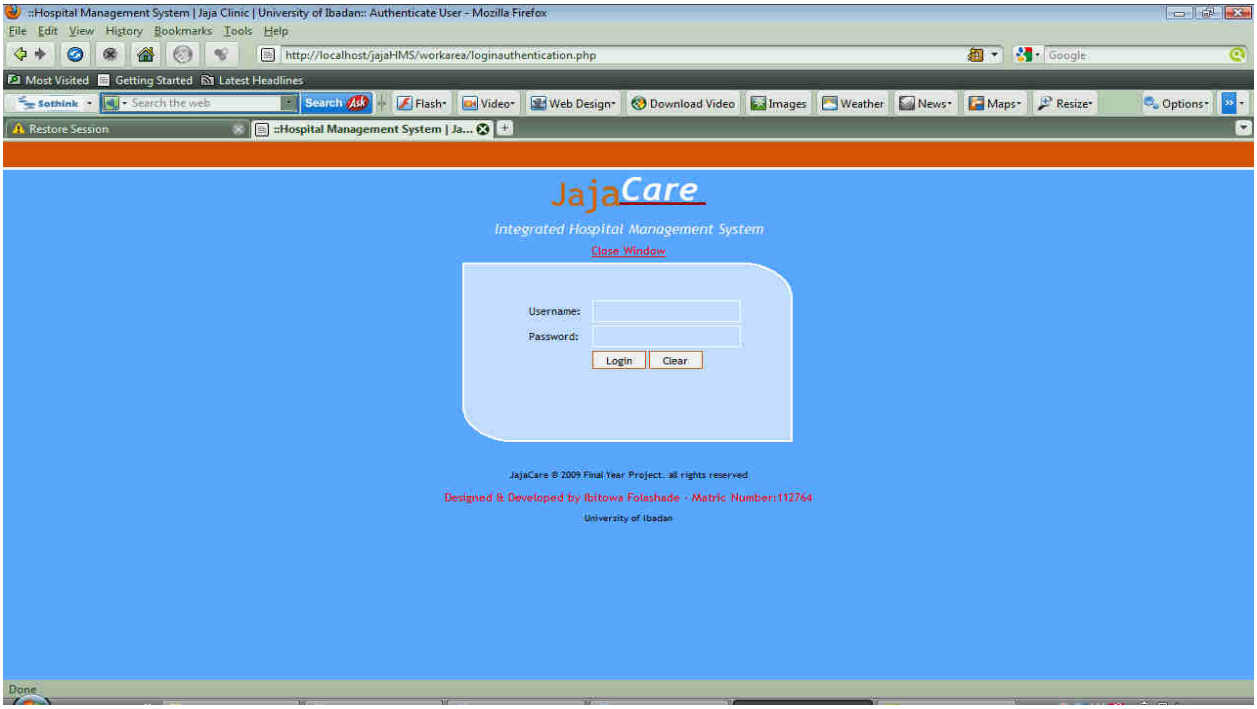

Fig.4.2: The login Screen

iii. Patient's New Record Insertion: Thisform allows new patient to be registered indicating last patient id giving the user idea of next patient to be registered.

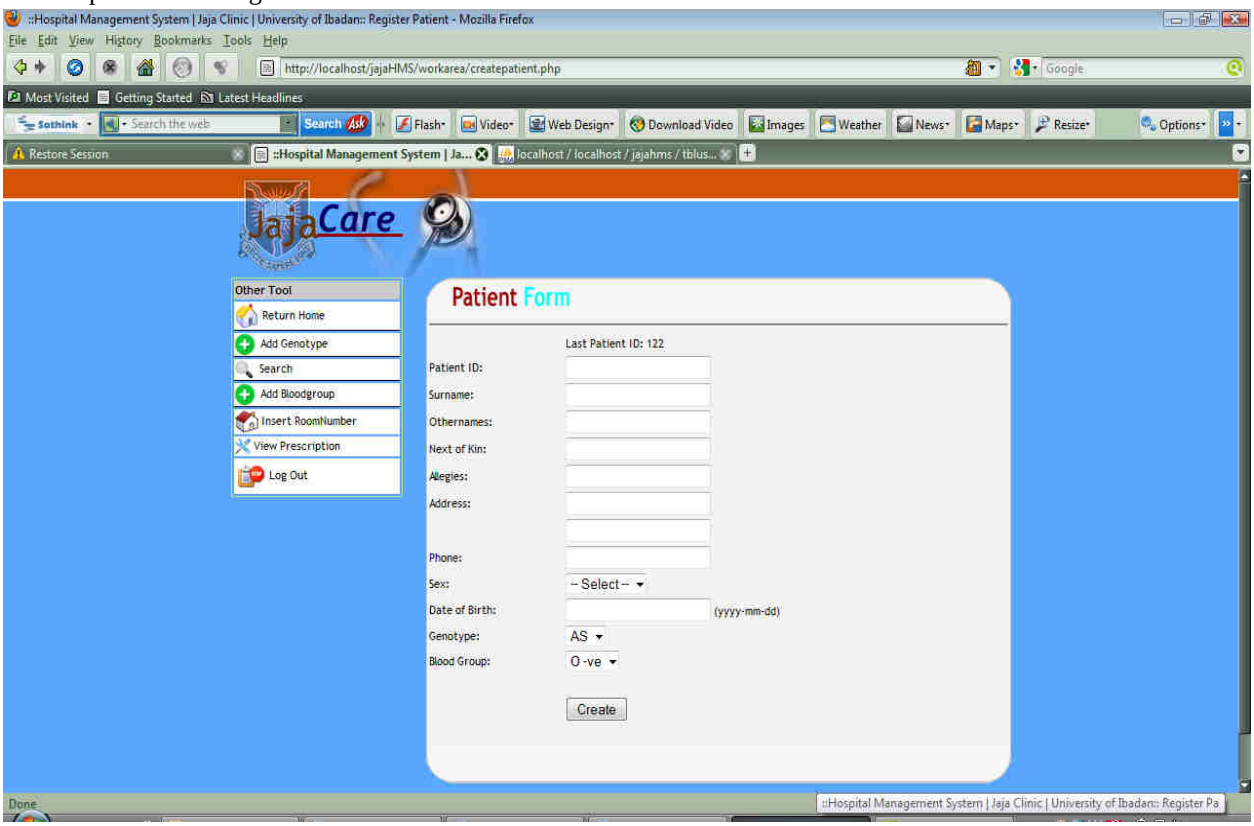

Fig.4.3: Patient New Record Page

iv. Other Record Insertion: This form allows blood group, genotype and room number to be created automatically by the user.

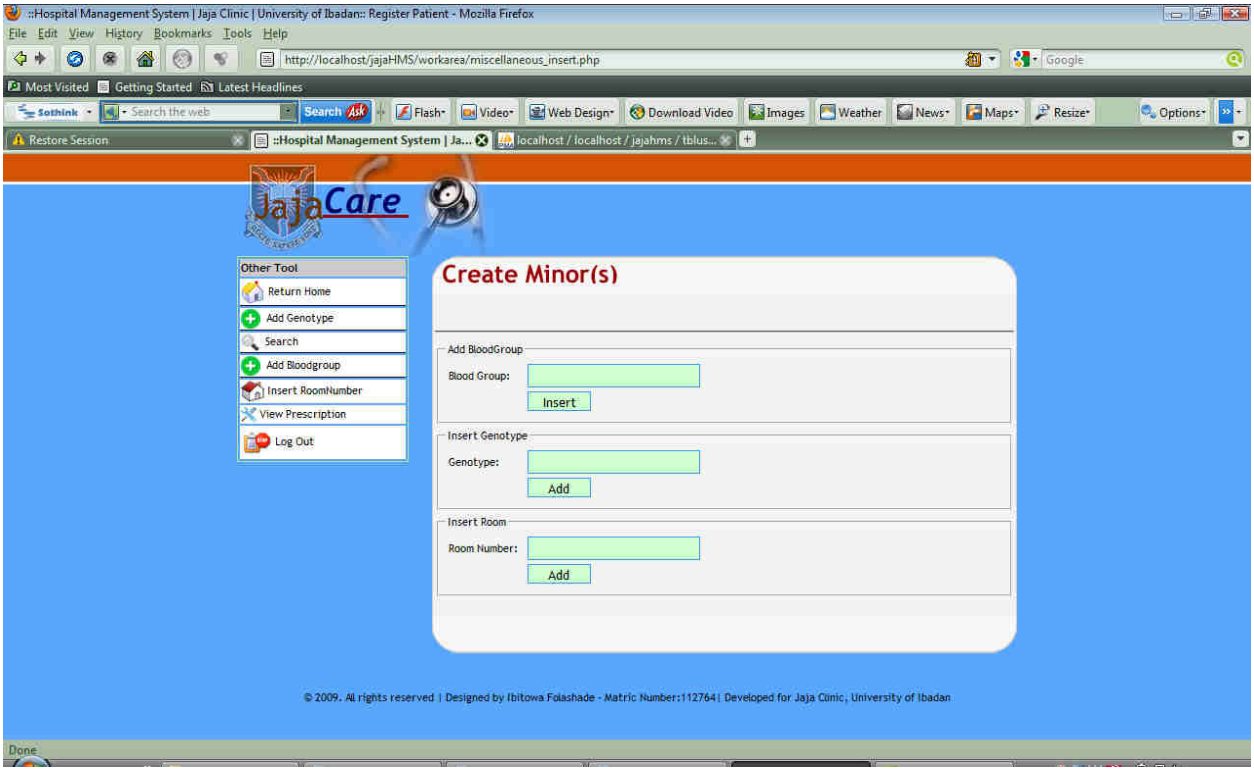

Fig.4.4: Other Record Page

v. Diagnoses Form: Thisform allows a patient to be queried with id and placed on the queue with indicated level of condition.

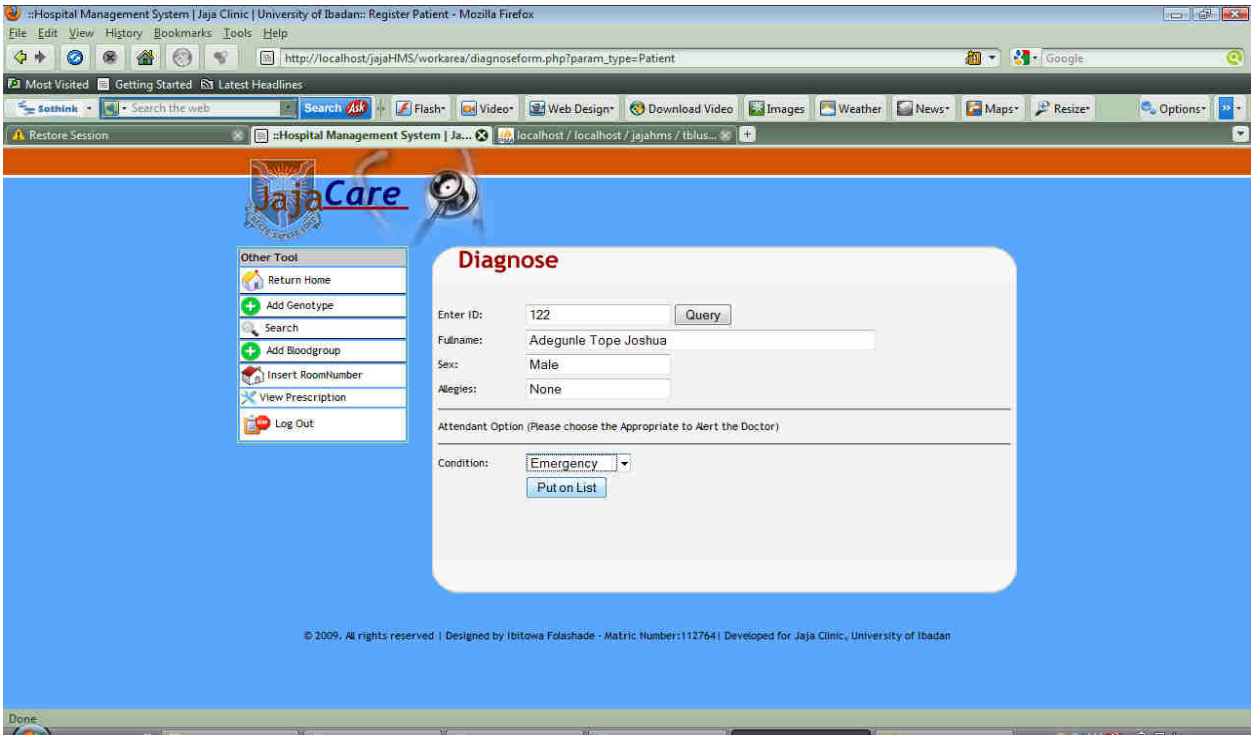

Fig.4.5: Diagnosis Form Page

Proposed System Outputs

The following represent snapshots from the system, showing reports which are displayed to the user during various procedures on the system.

i. Wrong Username/Password Entry –returns user to the same point indication failed authentication.

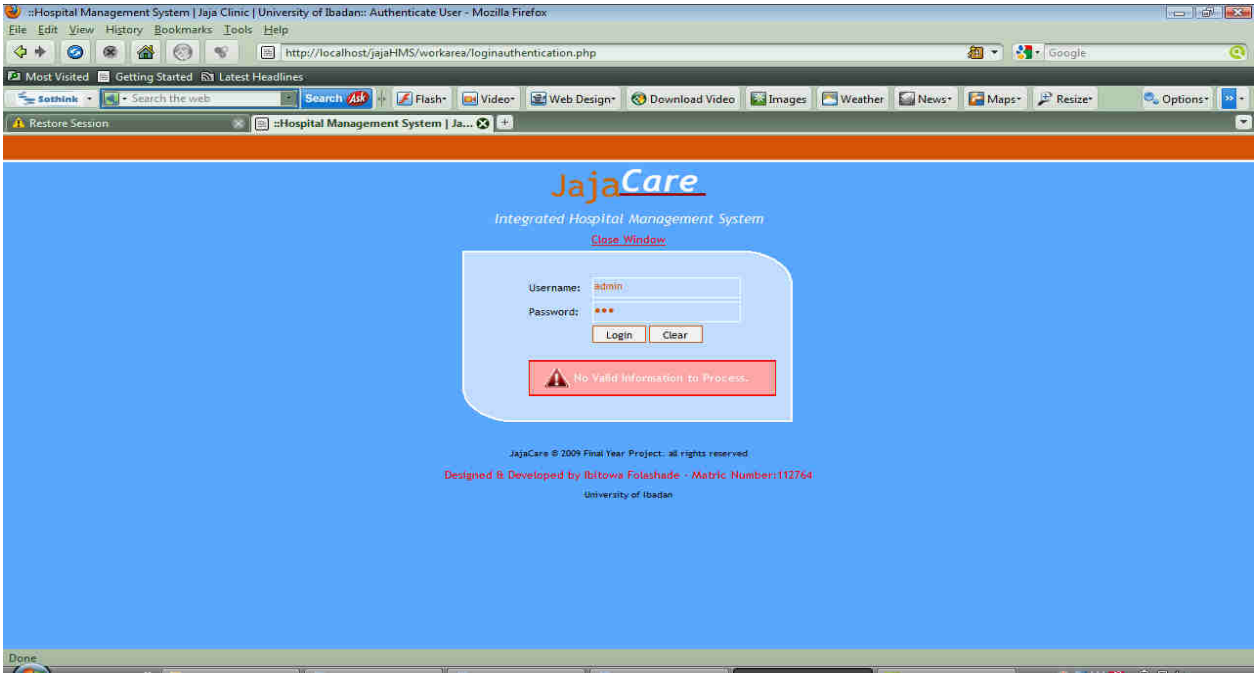

Fig.4.6: Invalid Access Page

ii. A Valid Authentication – redirects user to its work environment where the required actions can be executed like Registration, Diagnosis, Prescription, Data Search etc.

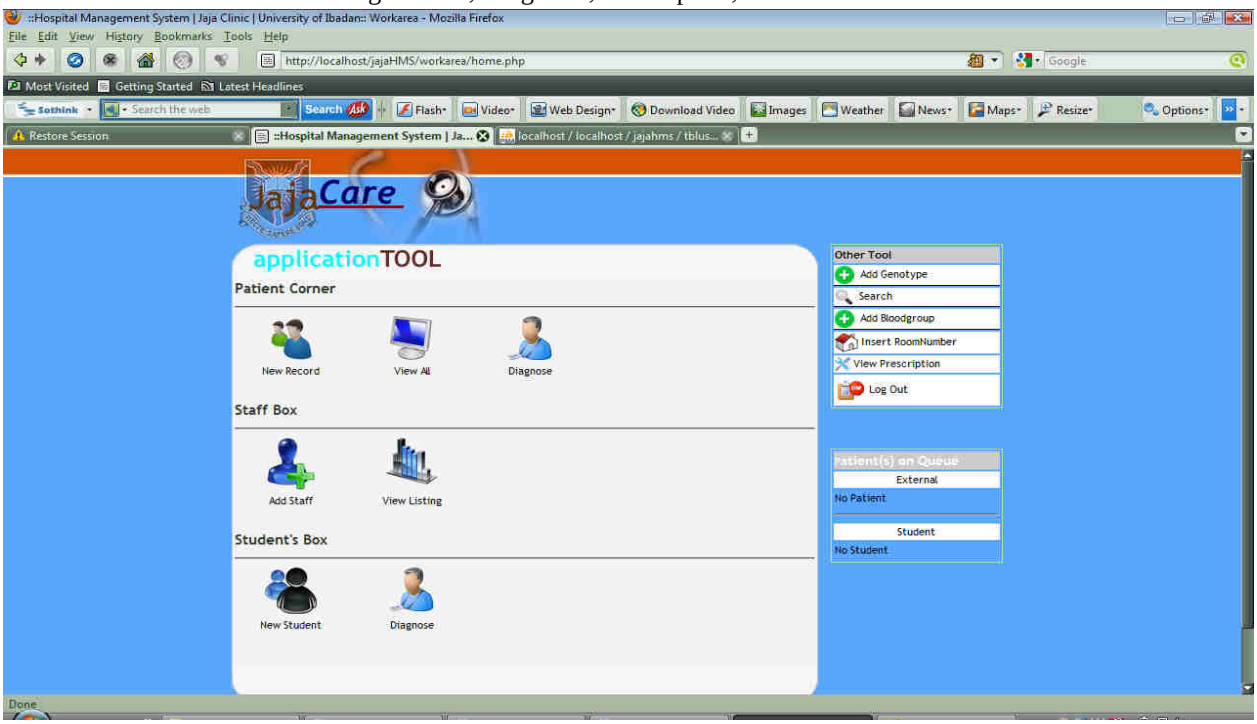

Fig.4.7: Valid Authentication Page

iii. Patient's Prescription Page – displays patient that has been diagnosed with drugs prescription.

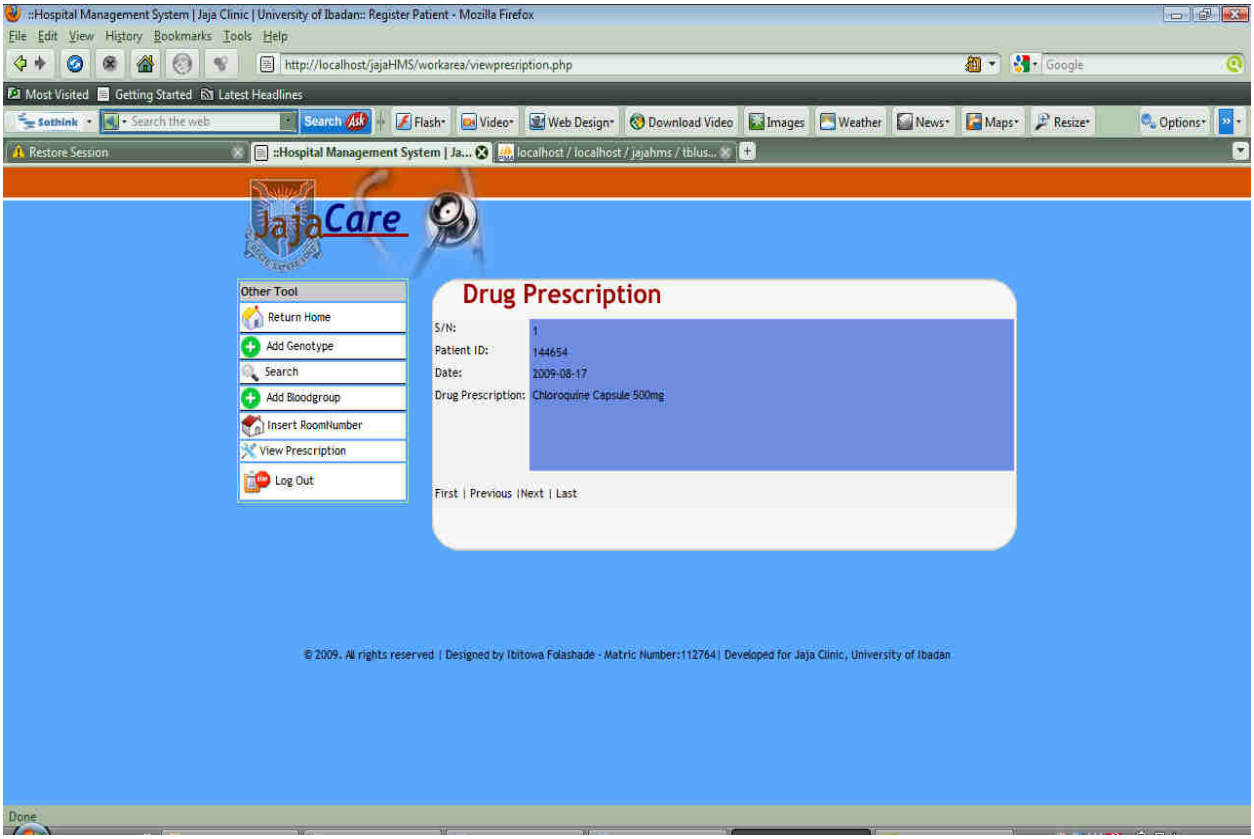

Fig.4.8: Patient's Prescription Page

iv. Records Page– displays all category of patient that have been registered.

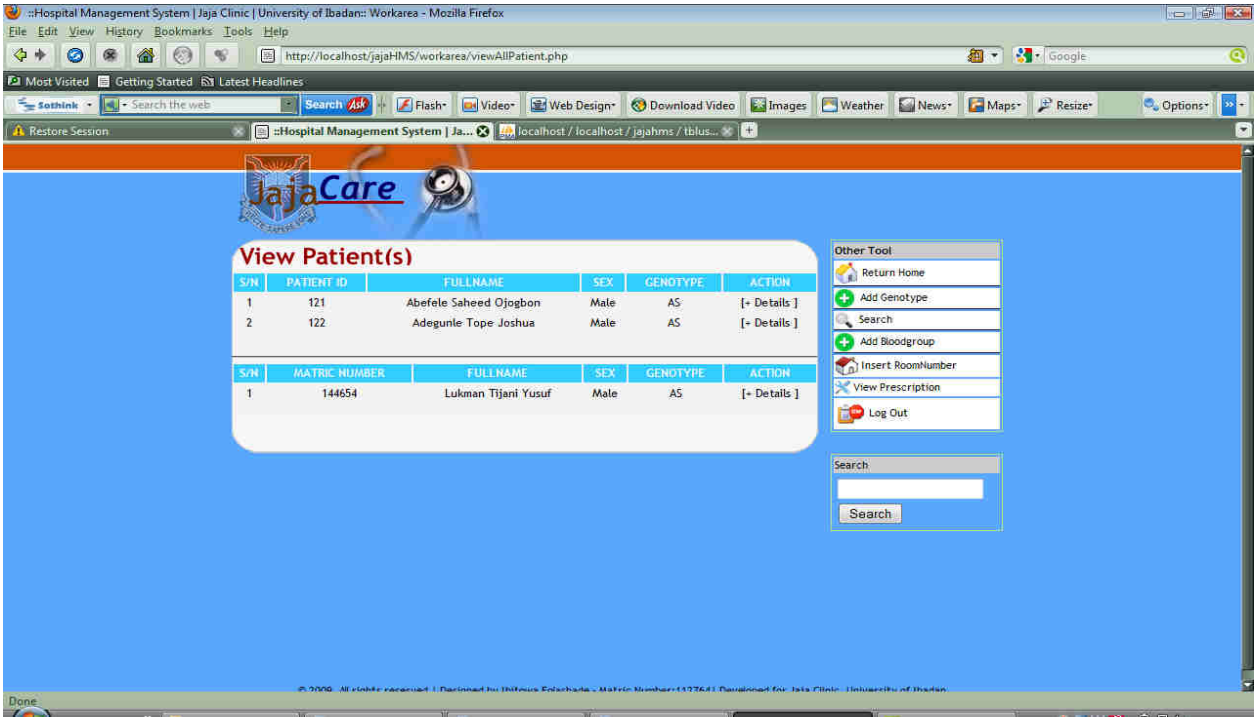

Fig.4.9: Record Page

iii. Listing Page– displays patient that is on queue for doctor's check-up.

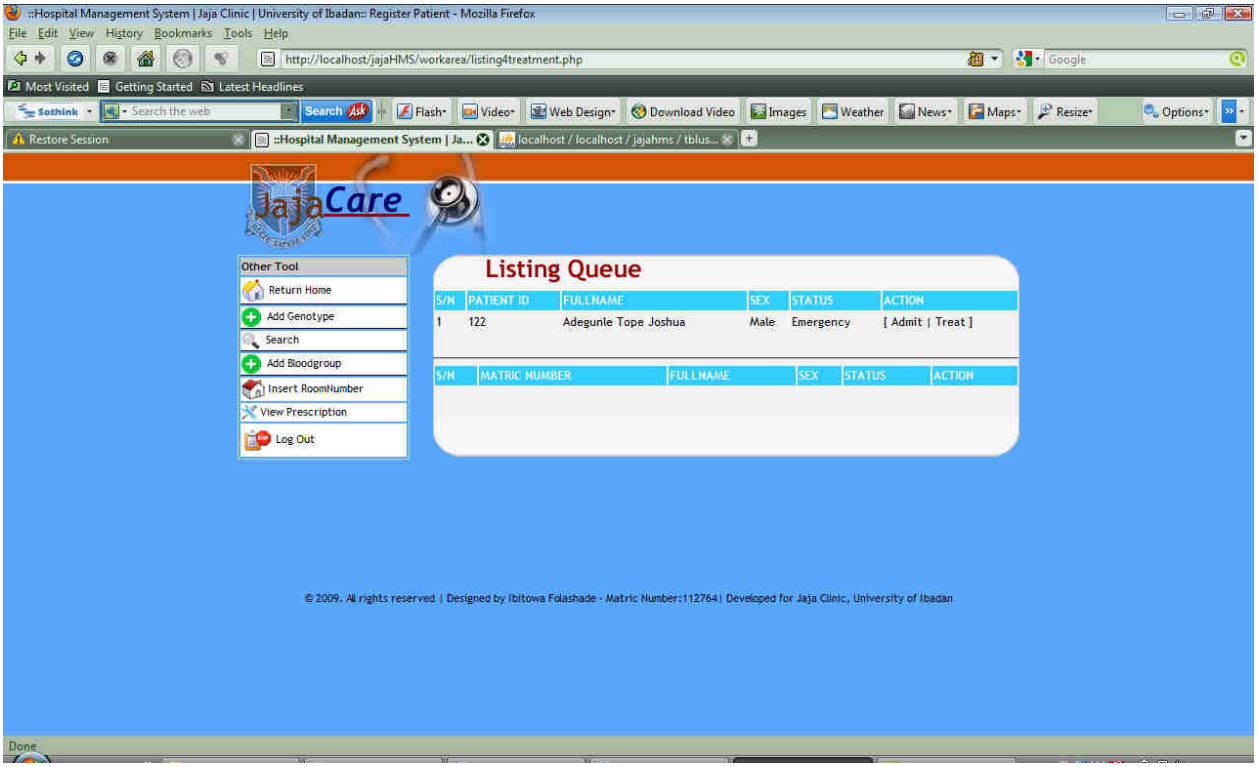

Fig.4.10: Listing Page

4.2 System Testing

The testingof the new system was carried out on each modules of the system to ensure that they meet necessary operational requirements such as authenticating the users of the system, generation of reports on request, allowing administrator to delete records in the database etc. Integration and system testing were carried out after all the modules had been put together to make a complete system in order to ensure that they are attuned and can be integrated to form a complete operational system.

V. CONCLUSION

Computers provides a means by which many procedures of processing data is automated. The system takes care of all the requirements of clinical operations and is capable of providing easy and effective storage of information related to patients that come up to the clinic. It generates test reports; provide prescription details including various tests, diet advice, and prescribed drugs to patients. This new system has provided the solutions to the problems associated with the existing manual system in the clinic. The system enhances the security of patients' information since authentication is required to access the system. The system provides efficiency in the clinic operational activities.

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